NASA News

National Aeronautics and
Space Administration
Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337-5099

For Release: June 13, 2000

Betty Flowers
elizabeth.b.flowers.1@gsfc.nasa.gov
Telephone: 757-824-1584

RELEASE NO.: 00-13

Prototype Balloon Passes 30-Hour Test Flight

NASA has successfully launched and demonstrated a prototype Ultra Long-Duration Balloon (ULDB), a revolutionary research balloon that may ultimately open a new era in scientific research by carrying telescopes and experiments weighing several tons to the brink of space for 100 days or more. The ULDB offers a flight duration lasting much longer, at a cost considerably less than a rocket flight and allows the payload to be retrieved and launched again.

The recent flight from Ft. Sumner, N.M., lasted more than 30 hours and tested the durability and functionality of the scientific balloon's unique pumpkin-shaped design and its novel material, a lightweight polyethylene film developed by Raven Industries, Inc., Sioux Falls, S.D., especially for the project. The new material is a co-extruded polyethylene film, about the thickness of ordinary plastic food wrap, with a high-density layer for strength and stiffness sandwiched between two linear low-density layers that provide toughness.

"The test flight was a resounding and unmitigated success," said Steve Smith, ULDB Project Manager, at the Wallops Flight Facility. "By chance, during the test flight the balloon flew over a very bad thunder storm at night, the worst-case condition in terms of cold temperatures. Yet we maintained a stable altitude for the duration of the flight." The new ULDB was developed by Physical Science Laboratory (PSL), Las Cruces, N.M., and Raven Industries under the direction of NASA Goddard Space Flight Center's Wallops Flight Facility, Wallops Island, VA.

The unique pumpkin shape of the ULDB shifts the entire payload carrying function and most of the pressure load to the load tendons. This puts less stress on the balloon material allowing for a lighter, yet much more-durable material that can carry the same

-more-

payload load for a much longer flight duration time than the heavier, less-durable balloon material of the conventional long duration balloon.

The test flight demonstrated the capabilities of the balloon vehicle and recovery systems and was the largest single-cell, super-pressure (fully sealed) balloon ever flown, Smith said. The Commendable Apex Package, developed by PSL, allowed for pressure monitoring and control of the balloon. This along with the redesign of a new subsystem by PSL and Raven were crucial to the success of this recent mission allowing the ULDB team to move forward with plans for a full-scale, global balloon test flight this winter from Australia.

When fully inflated, the massive ULDB would barely fit in a football stadium. It will soar with up to a 3,500-pound (1,588 kilogram) payload above 99% of the Earth's atmosphere, up to an altitude of just over 115,000 feet (35 kilometers) or 3-4 times higher than passenger planes. The recent Ft. Sumner test flight -- with a balloon similar in design to the ULDB but roughly 1/10 the volume -- reached an altitude of 93,000 feet (28.3 kilometers) carrying a 1,660-pound (753 kilogram) payload.

The ability to fly balloons for months or years at a time will create a multitude of scientific and business opportunities. Conventional high-altitude scientific balloon flights typically last a few days to a week because temperature changes from day to night ultimately cause the balloon to lose altitude.

During the day, the Sun warms the balloon's surface causing the helium gas to expand. A small amount of excess gas is vented out into the atmosphere. When the Sun sets, the gas cools and contracts. As a result, the balloon volume decreases causing the balloon to lose altitude. Dropping ballast can help raise the balloon and maintain altitude until the ballast is depleted ending the mission. To terminate the flight, a ground control team sends a computer command to an on-board system that makes a small tear in the balloon material. The experiment section and its parachute release from the balloon and safely fall to the ground.

Conventional scientific balloon flights are routinely conducted from Antarctica or above the Arctic Circle and can last up to 21 days because the daylight (or nighttime) is six months long and there is very little atmospheric or temperature change. The balloon eventually sinks, however, as gas leaks out or the balloon encounters nighttime conditions.

The ULDB differs from conventional scientific balloons now being flown because it is completely sealed, so gas is not vented to relieve pressure. Smith said the new balloon material is strong enough to maintain pressure differences, secure enough to resist leaking and durable enough to hold up to prolonged UV radiation in the high atmosphere. The test flight, in fact, remained at a constant altitude for the entire flight despite drastic temperature changes.

-more-

The first fully operational ULDB flight with a scientific payload is currently scheduled for December 2001 from New Zealand.

The ULDB was highlighted in the National Research Council's decadal survey, "Astronomy and Astrophysics in the New Millennium," and has an important role in providing inexpensive access to a near-space environment.

For more information and images, refer to: http://www.wff.nasa.gov/~uldb

####################